apparel impact institute

Aii Carbon & Energy Benchmark

Webinar to Solicit Feedback on Draft

November 2025


Welcome

Welcome

Kurt Kipka

CHIEF IMPACT OFFICER, AII

Leonie Schmid

DIRECTOR OF SUSTAINABILITY REPORTING, AII

Phil Patterson

MANAGING DIRECTOR, COLOUR CONNECTIONS TEXTILE CONSULTANCY

Michael Sadowski

CONSULTANT TO AII (MODERATOR)

Agenda

Context and objectives	10 mins
Benchmark details	30 mins
Questions and answers	20 mins

All participants will be on mute, and can submit questions and comments via the Q&A function


Context

Benchmark Context

- Over 600 apparel companies have set science-based climate targets and are taking action to reduce greenhouse gas (GHG) emissions
- Several brands and organizations are developing their own benchmarks - which could create misalignment and an additional burden for suppliers
- There is a need for robust and independent benchmarks on what “good” energy and GHG emissions performance looks like for manufacturing
- With agreed benchmarks, companies can focus on reducing emissions - not developing different performance schemes

Benchmark Objectives

In defining “good” energy and emissions performance, the benchmark aims to:

- Offer a consistent and credible way to measure performance
- Enable facility-to-facility comparisons vs. individual facility % reductions
- Provide a tailored approach to evaluating specific on-site products and processes (energy and emissions per kg of production)
- Guide manufacturers to inform operational improvements and investment priorities
- Support brands to identify and reward higher-performing suppliers
- Prioritise interventions (low and high performing facilities)

Benchmark Development Process

September
Project Start

April -December
Testing of benchmark tool v0.8 & v0.9 - online & onsite excel questionnaire (approx. 400 facilities)

July
First draft of dry processing tool created by experts

November -January
Testing of benchmark tool v0.9 - digitized questionnaire (approx. 100 facilities)

2024 2025 2026

January
First draft of wet processing tool created by experts

April - August
Regular TRC consultations

November
Publication for consultation of Energy & Carbon benchmark tool

January
Final benchmark tool publication

Technical Review Committee

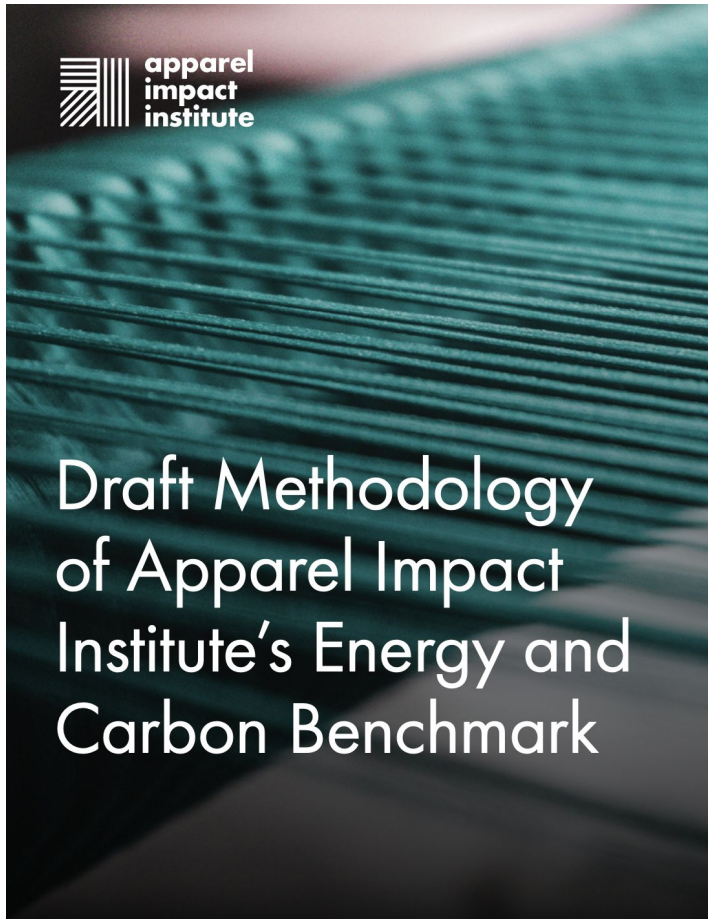
- Artistic Milliners: Saqib Sohail
- Aii: An Zhou, Kurt Kipka, Leonie Schmid
- Bluesign: Reinhard Umber
- BluWin: Dr. Siva Pariti
- Cascale: Joel Mertens, Jeremy Lardeau
- Colour Connections: Phil Patterson
- Elevate Textiles: Jimmy Summers
- H&M: Kim Hellstrom, Niklasx Johansson
- Inditex: Fernando Echevarria Camarero
- Made2Flow: Atnyel Guedj
- MAS Holdings: Rakith Alkegama
- RESET Carbon: Sophie You, Cyrus Lam, Liam Salter

Stakeholder Consultation

Aii published the **draft benchmark** for consultation on November 14, and there are several ways to provide feedback:

1. Survey (link)
2. Email benchmark@apparelimpact.org (put "Aii's Energy and Carbon Benchmark Consultation" in the subject)
3. Two webinars (November 20 and 25)

Aii will compile feedback and publish a revised benchmark v1.0 in January 2026



Benchmark Details

Presenter:

Phil Patterson

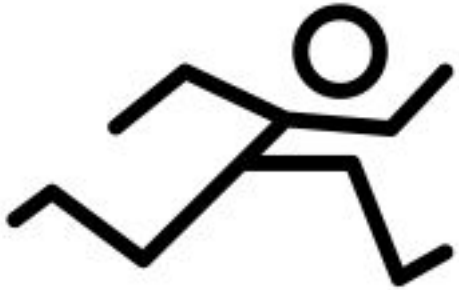
MANAGING DIRECTOR,
COLOUR CONNECTIONS TEXTILE CONSULTANCY

Who is the Better Runner?

Reduced their time by
30% in the last 12 months

Runner A

Reduced their time by
3% in the last 12 months



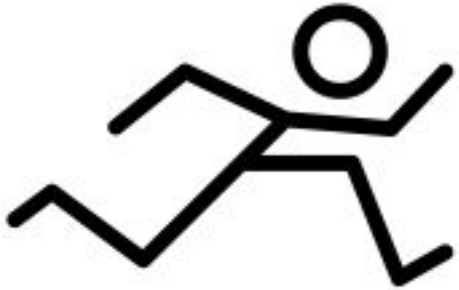
Runner B

Who is the Better Runner?

Reduced their time by
30% in the last 12 months

Runner A

Reduced their time by
3% in the last 12 months



Runner B

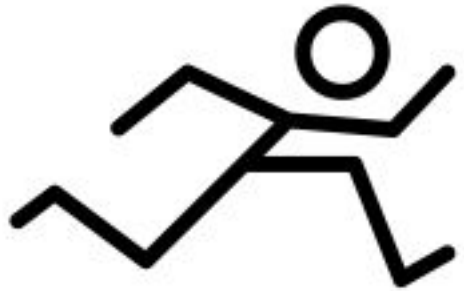
Depends where they started from.

Who is the Better Runner?

Race Completed in 1h 55 mins

Runner A

Race Completed in 2h 5 mins



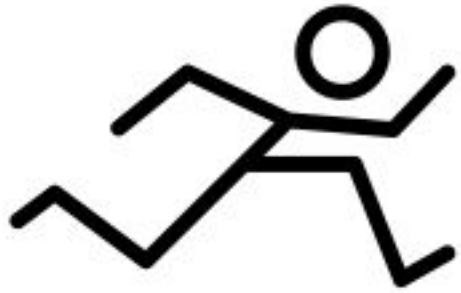
Runner B

Who is the Better Runner?

Race Completed in 1h 55 mins

Runner A

Race Completed in 2h 5 mins



Runner B

Who said they ran the same race? Depends on the distance of the race!

Who is the Better Runner?

Race Completed in 1h 55 mins

Half Marathon

Runner A

Race Completed in 2h 5 mins

Full Marathon

Runner B

Who said they ran the same race? Depends on the distance of the race!

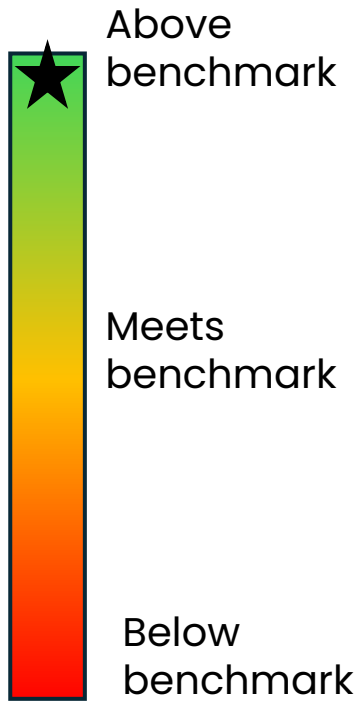
Who is the Better Runner?

Half marathon completed in 1h 55 mins

Average Social Runner

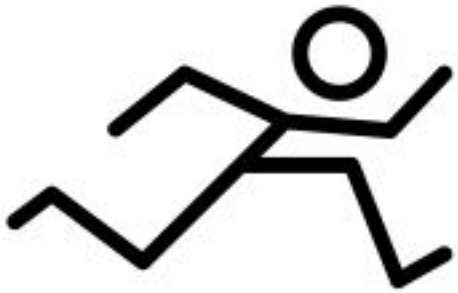
Full marathon completed in 2h 5 mins

World Class Elite Runner

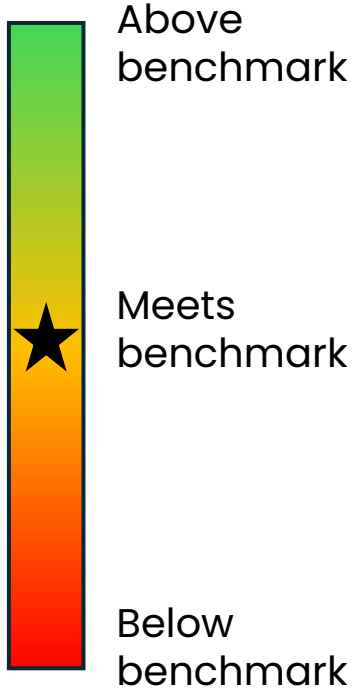


Who Wins Medals Despite a 3% Year on Year Improvement ?

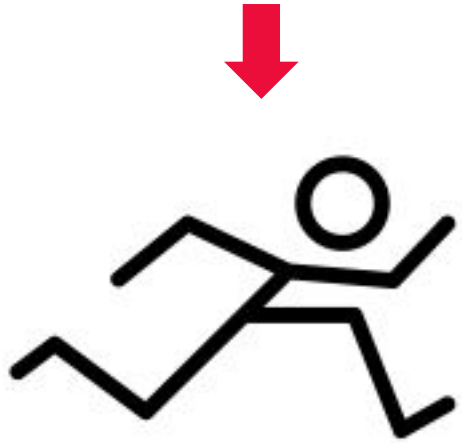
Half marathon completed in 1h 55 mins



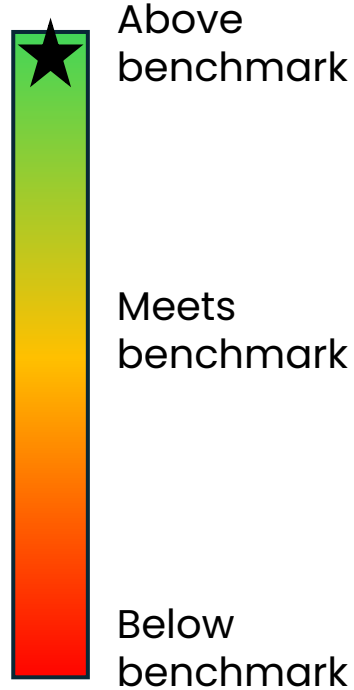
Average Social Runner



Full marathon completed in 2h 5 mins

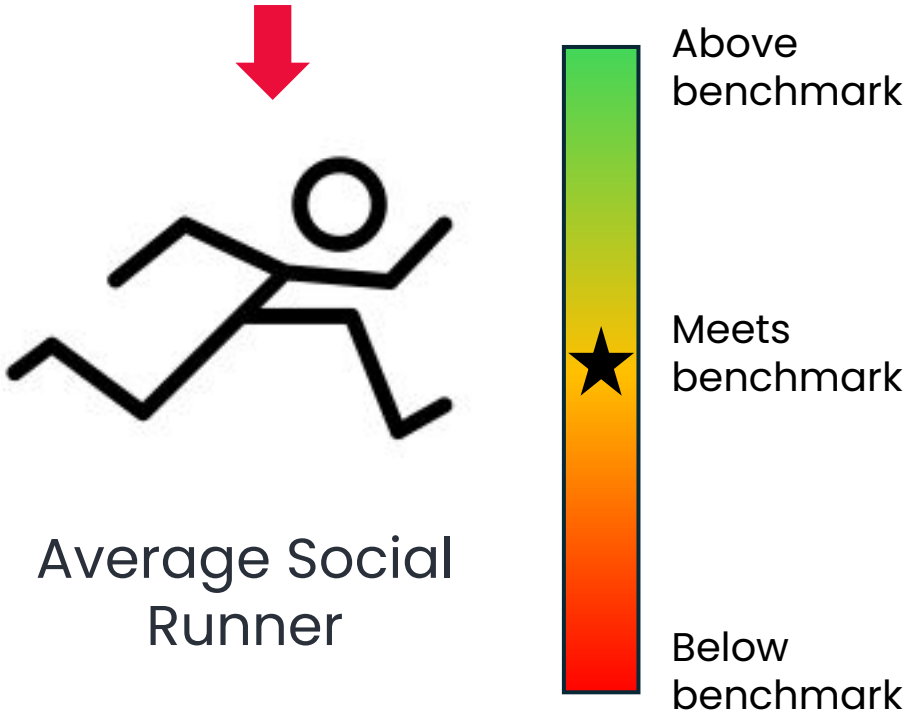


World Class Elite Runner



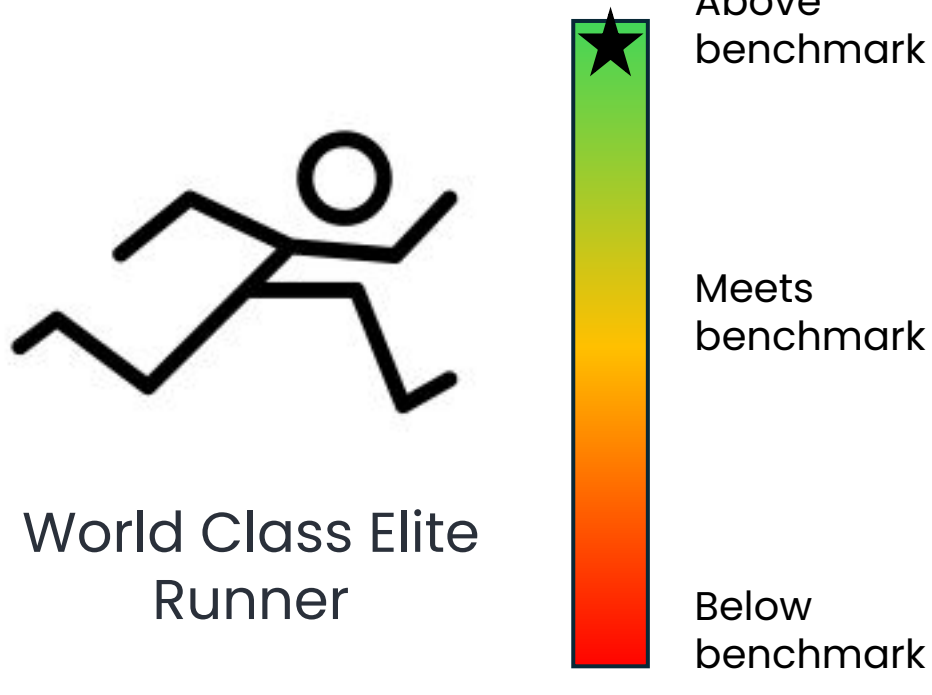
Who Has the Most Potential for Further Improvement?

Half marathon completed in 1h 55 mins



Average Social Runner

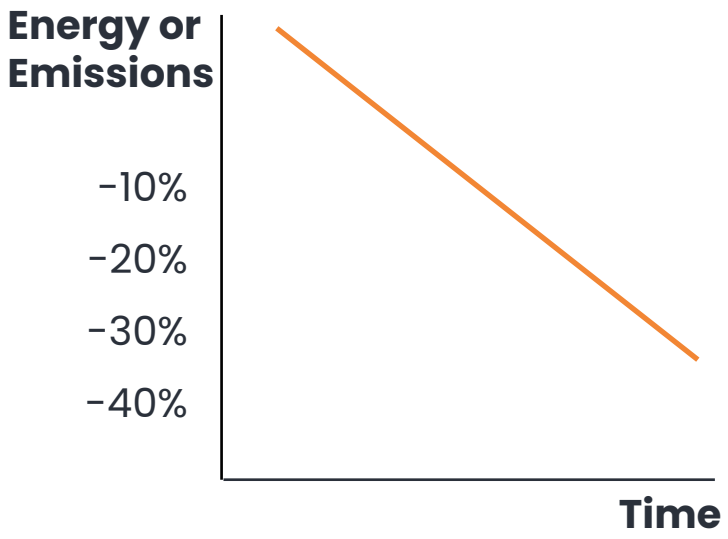
Full marathon completed in 2h 5 mins



World Class Elite Runner

In Factory Terms...

You may know this



But...

- Where did they start?
- What processes are carried out?
- What is the actual performance... good, OK, poor?
- Is there further room for improvement?

Current Facility Approaches

Pros

- There is activity and engagement
- Continuous improvement is good
- Calculate ∑energy use and emissions
- Individual facilities can monitor year-on-year performance
- Action of fuel switches
- Action of promotion of renewable energy

Cons

- You can have large % improvement and still be poor
- No OBJECTIVE measure of good / OK / poor
- No way to compare different facilities
- No way to prioritise efforts / see potential for improvement
- No tier-by-tier analysis of verticals

How Does the Aii Benchmark Work?

2 Stage Process

1. Create the tailored energy and emission benchmarks for the facility

2. Appraise the facility performance against the benchmarks

How Does the Aii Benchmark Work?

Creating Tailored Benchmarks

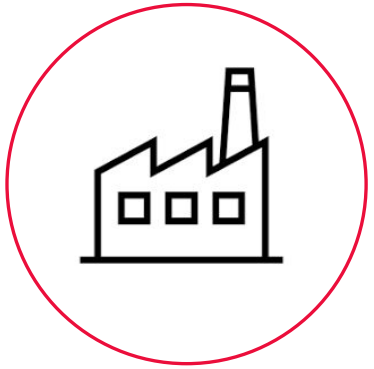
- We'll require the production volumes for the products/processes manufactured on-site
- We have created calculators (with databases of typical energy intensities of wet and dry processes) and a weighted average energy and emissions benchmark is calculated.

How Does the Aii Benchmark Work?

In the database

Process	Energy Intensity	Tonnes per Annum
I	10 kWh / kg	1000
J	18 kWh / kg	2000
K	14 kWh / kg	500

THIS IS ALL WE NEED



Automatically Calculated

Weighted Average Energy Target — **15.14 kWh/kg**

Weighted Average Emissions Target — **4225 gCO_2/kg**

Above benchmark

Meets benchmark

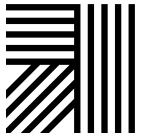
Below benchmark

Above benchmark

Meets benchmark

Below benchmark

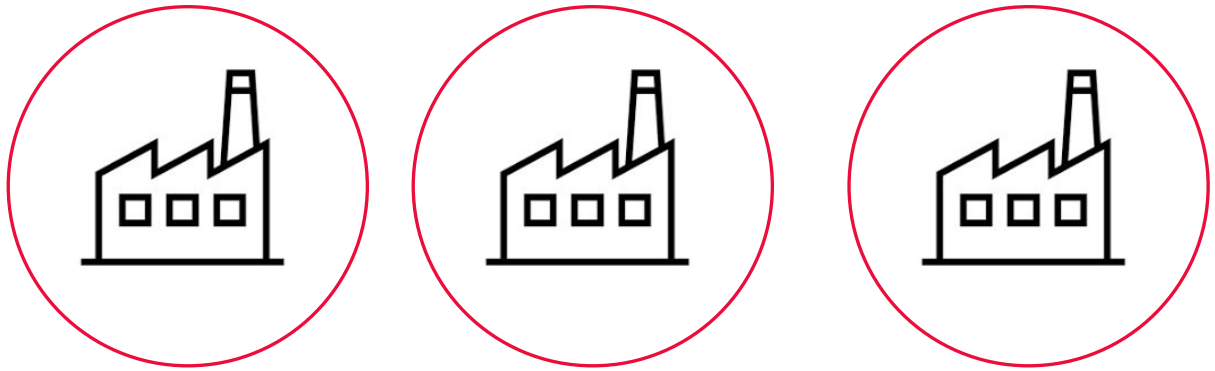
Actual Metrics From Calculators



- WEIGHTED AVERAGE EMISSIONS (gCO_2/Kg)
- WEIGHTED AVERAGE ENERGY (kWh/kg)
- WEIGHTED AVERAGE ENERGY (MJ/kg)
- Thermal Energy Indicator (kWh/kg)
- Electrical Energy Indicator (kWh/kg)
- Electrical USE Indicator (kWh/kg).....takes RE into account
- Thermal Emissions Indicator (gCO_2/kg)
- Electrical Emissions Indicator (gCO_2/kg)

How the Aii Benchmark Works for Verticals

SPINNING **KNITTING** **DYEING**



Process	Energy Intensity	Tonnes per Annum

Process	Energy Intensity	Tonnes per Annum

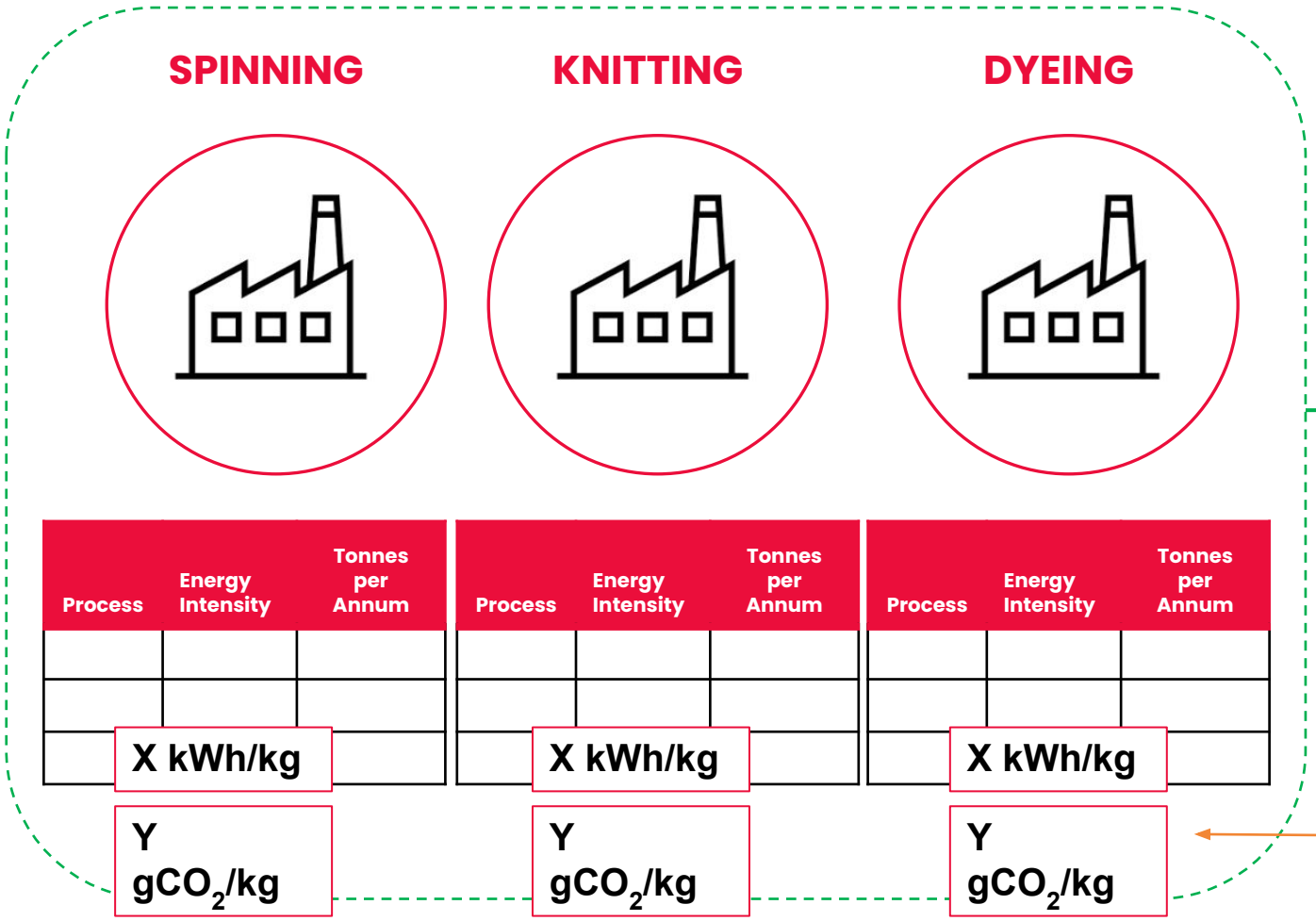
Process	Energy Intensity	Tonnes per Annum

Weighted Average Energy Target — **X kWh/kg**

Weighted Average Emissions Target — **Y gCO_2/kg**

Single 'black box' target for facility

How the Aii Benchmark Works for Verticals

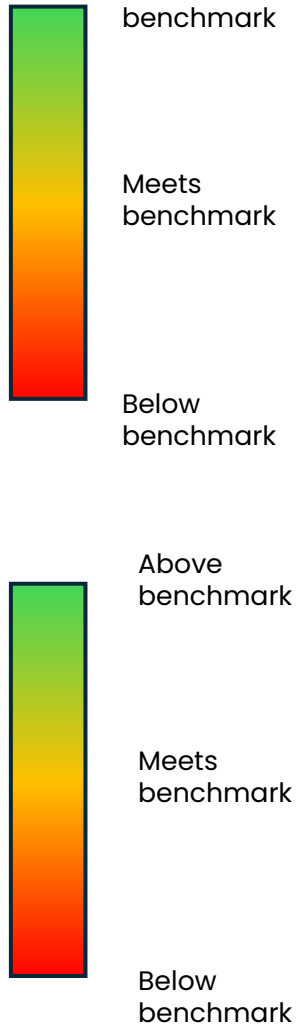


Weighted Average Energy Target — X kWh/kg

Weighted Average Emissions Target — Y gCO_2/kg

Single 'black box' target for facility

Plus... Individual tier targets



Facility Assessment

We NEED

- Details of production types / volumes
- Details of on-site fuel use and steam purchases
- Details on grid electricity, on-site renewables, PPA’s etc

We RECOMMEND

A utility map:

- Shows where electricity, steam, fuel, water and compressed air are used throughout the facility
- Enables tier-by-tier analysis in a vertical facility

Energy Intensity vs Emission Factors

- Energy use (kWh / kg) is in the hands of the facility – it is a measure of their eco-efficiency performance
- Emissions per kWh depends on fuel type only partially in the hands of the facility
  - Fuel choice may be limited, but can be open to changes
  - Grid cleanliness is out of the facility's control
    - Electrification of equipment/utilities may, or may not be sensible
  - Facilities can consider RE and/or PPA
- Emissions (gCO_2 / KG) influenced by both facility operations and external factors

Energy-Efficient Facility With On-Site Coal Boiler and Average Cleanliness Grid Electricity

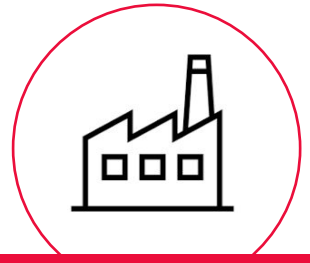
Benchmarks

- WEIGHTED AVERAGE EMISSIONS (gCO_2/Kg)
- WEIGHTED AVERAGE ENERGY (kWh/kg)
- WEIGHTED AVERAGE ENERGY (MJ/kg)
- *Thermal Energy Indicator (kWh/kg)*
- *Electrical Energy Indicator (kWh/kg)*
- *Electrical USE Indicator (kWh/kg)… takes RE into account*
- *Thermal Emissions Indicator (gCO_2/kg)*
- *Electrical Emissions Indicator (gCO_2/kg)*

Actual Factory Performance

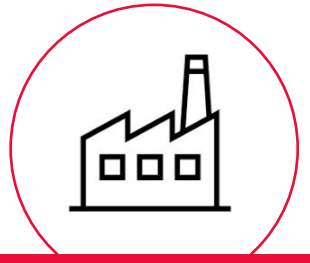
- WEIGHTED AVERAGE EMISSIONS (gCO_2/Kg)
- WEIGHTED AVERAGE ENERGY (kWh/kg)
- WEIGHTED AVERAGE ENERGY (MJ/kg)
- *Thermal Energy Indicator (kWh/kg)*
- *Electrical Energy Indicator (kWh/kg)*
- *Electrical USE Indicator (kWh/kg)… takes RE into account*
- *Thermal Emissions Indicator (gCO_2/kg)*
- *Electrical Emissions Indicator (gCO_2/kg)*

Which Facility is Better?



Dyehouse A

- Package Dyeing:
  - 20% acrylic yarn
  - 50% cotton yarn
  - 30% polyester yarn
- 30% reduction in the last year, from 15 to **12 kWh / kg**
- On-site gas Boiler (2,292,909 m3)
- On-site gas Genset (981,818 m3)
- Total production 3,000 tonnes per year
- Off-site ETP

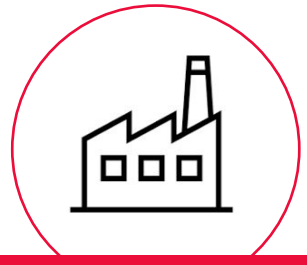


Printer B

- Printing Woven Fabric
  - 15% viscose (Reactive-Rotary)
  - 35% viscose (Pigment-Rotary)
  - 50% vIscose (Pigment-Digital)
- 5% reduction in the last year, from 12.6 **to 12 kWh/kg**
- On-site coal boiler (2625 tonnes)
- On-site diesel genset (841,121 litres)
- Total production 2,500 tonnes per year
- Off-site ETP

Dyehouse A

WEIGHTED AVERAGE EMISSIONS (gCO_2/Kg)	2920.31	2424.00
WEIGHTED AVERAGE ENERGY (kWh/kg)	10.69	**12.00**
WEIGHTED AVERAGE ENERGY (MJ/kg)	38.50	43.22
Thermal Energy Indicator (kWh/kg)	7.32	8.4
Electrical Energy Indicator (kWh/kg)	3.37	3.6
Electrical USE Indicator (kWh/kg)	1.41	1.5
Thermal Emissions Indicator (gCO_2/kg)	2137.70	1696.8
Electrical Emissions Indicator (gCO_2/kg)	782.61	727.2

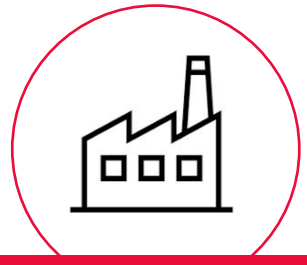


Dyehouse A

- Package Dyeing:
  - 20% acrylic yarn
    - [6.15 kWh/kg]
  - 50% cotton yarn
    - [13.57 kWh/kg]
  - 30% polyester yarn
    - [8.94 kWh/kg]
- 30% reduction in the last year, from 15 to **12 kWh / kg**
- On-site gas Boiler (2,292,909 m3)
- On-site gas Genset (981,818 m3)
- Total production 3,000 tonnes per year
- Off-site ETP

Printer B

WEIGHTED AVERAGE EMISSIONS (gCO_2/Kg)	3674.55	3964.8
WEIGHTED AVERAGE ENERGY (kWh/kg)	13.22	**12.00**
WEIGHTED AVERAGE ENERGY (MJ/kg)	47.59	43.2
Thermal Energy Indicator (kWh/kg)	10.13	8.4
Electrical Energy Indicator (kWh/kg)	3.09	3.6
Electrical USE Indicator (kWh/kg)	1.29	1.5
Thermal Emissions Indicator (gCO_2/kg)	2957.68	3007.2
Electrical Emissions Indicator (gCO_2/kg)	716.87	957.6



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  - 35% viscose (Pigment-Rotary)
    - [12.85 kWh/kg]
  - 50% vIscose (Pigment-Digital)
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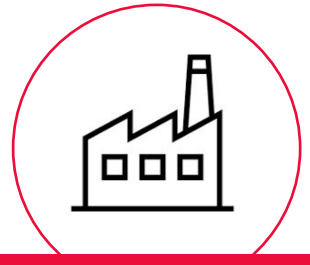
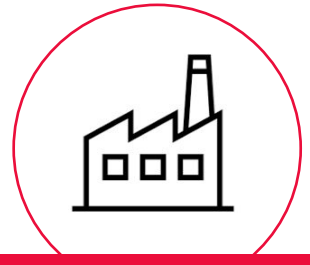
Which Facility is Better?



Dyehouse A

- Under-performing on energy / kg
- Over-performing on emissions / kg
- Cumulative emissions = 7,272 TCO_2e
- Action = Improve energy efficiency



Printer B

- Over-performing on energy / kg
  - Over-performing on thermal
  - Under-performing on electrical
- Under-performing on emissions / kg
- Cumulative emissions = 9,912 TCO_2e
- Action = Further improve energy efficiency and/or on-site fuel switch, PPA

Aii's Benchmark Tool - Data in the Database

- **Typical energy intensity for all model production processes**
  - Electrical / Thermal split
  - +Energy USE
- **Typical emissions for all model production processes**
  - Electrical / Thermal split
- **+ Correction factors**
  - ETP, ZLD, Physical finishing in wet processing
  - Twisting, covering etc in spinning

Aii's Benchmark Tool - The Database Creation

- **Wet processing**
  - Primary data
    - Both process demand and energy content of fuel
  - Modelling software – to fill in gaps where no primary data exists
  - Professional judgement
- **Dry Processes**
  - Statistical analysis of primary data


Questions

Questions

Prompts to guide your questions and feedback:

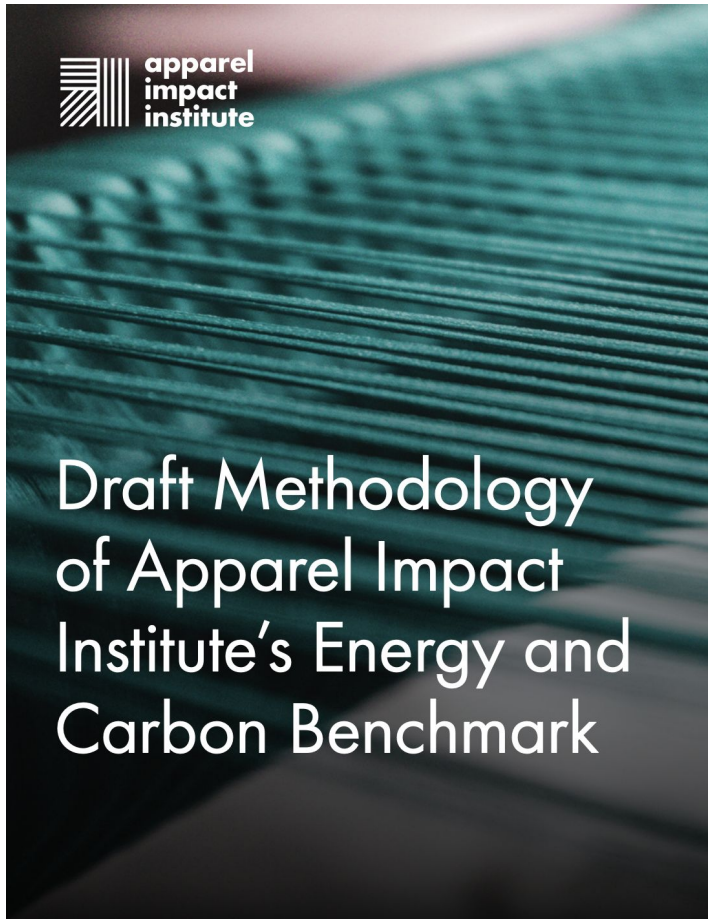
- What elements of the benchmark need clarification?
- What information is missing?

Please enter your questions and comments using the Q&A feature

Reminder: Other Feedback Mechanisms

1. Survey (link)
2. Email benchmark@apparelimpact.org (put “Aii’s Energy and Carbon Benchmark Consultation” in the subject)

Aii will compile feedback and publish a revised benchmark in January 2026




Thank You